

# *Leionema scopulinum* (Rutaceae), a new species from Wollemi National Park

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## Abstract

Bryony M. Horton<sup>1</sup>, Darren M. Crayn<sup>1\*</sup>, Steve W. Clarke<sup>2</sup> and Haydn Washington<sup>3</sup> (<sup>1</sup>National Herbarium of New South Wales, Botanic Gardens Trnst, Sydney, NSW 2000, Australia; <sup>2</sup>School of Science, Food and Horticulture, University of Western Sydney, Hawkesbury Campus, Richmond, NSW 2753, Australia; <sup>3</sup>Lot 35, Widden Trail, Nullo Mountain, Rylstone, NSW 2849, Australia. <sup>\*</sup>for correspondence: darren.crayn@rbgsyd.nsw.gov.au) 2004. *Leionema scopulinum* (Rutaceae), a new species from Wollemi National Park. *Telopea* 10(4): 815–822. *Leionema scopulinum* B.M. Horton & Crayn is described and compared with related species. Illustrations, a distribution map and a modified *Flora of New South Wales* key are provided along with notes on the ecology of the species.

## Introduction

Over two weeks beginning on June 19, 2003, one of us (SWC), collected specimens of an interesting and unfamiliar shrub bearing striking greenish-yellow flowers from narrow, rocky ridges in the Lee Creek catchment (Wollemi National Park, New South Wales). The specimens keyed out to *Leionema* (plants lacking scales, having five, free, valvate sepals, five valvate petals, and versatile anthers with a retuse apex that lack an apical gland), but did not match any of the currently recognised species (Wilson 1998, Weston & Harden 2001). Coincidentally, another one of us (HW) independently discovered another occurrence of the novelty in the vicinity of Nullo Mountain on August 6. Since November 2003 a further 22 occurrences have been discovered, bringing the total number to 29.

Until recently *Leionema* was treated as a section of *Eriostemon* (e.g. Mueller 1882, 1889) or *Phebalium* (e.g. Bentham 1863, Wilson 1970). Wilson (1998) raised this section to generic rank based on floral and seed morphology. With the addition of the species described herein, *Leionema* (F.Muell.) Paul G. Wilson comprises 24 species, 23 in the eastern states of Australia and one species (*Leionema nudum* (Hook.) Paul G. Wilson) in New Zealand. Two other undescribed species are known from the Colo River (central coast of New South Wales; *Leionema* sp. 'Colo' [Weston 2423]) and the Macleay River (north coast of New South Wales), respectively. These will be dealt with separately. Terminology in this paper follows Wilson (1998), however it should be noted that the hairs in this species should probably be described as branched rather than stellate since they lack a consistently star-like morphology.

## Taxonomy

*Leionema scopulinum* B.M. Horton & Crayn sp. nov.

Frutex scopulos inhabitans. Ramuli angulares, stellato-pubescentes. Lamina plerumque serrulato-marginata, 24–65 mm longa, 4.5–10.0 mm lata. Inflorescentia

erecta floribus 9–32. Aestivatio petalarum valvata, petalis denique 6.6–8.1 mm longis, 1.5–2.0 mm latis, virido-citrinis vel citrinis. Cocci 5.5–7.0 mm alti, rostris 1.5–3.0 mm longis.

**Type:** New South Wales: Central Tablelands: Wollemi National Park: *D. Crayn* 595, *J. Allen, H. Washington, P. Weston*, 28 Aug 2003 (holo NSW 612970; iso CANB, K, MEL, PERTH). (Specific locality details withheld for conservation purposes).

Erect shrub 0.5–3 (–4) m high, usually about 1.5 m. Branchlets angled due to leaf decurrencies, sparsely to densely hairy, often more densely so toward tips, the hairs white, stellate, about 0.1 mm diameter. Leaves strongly aromatic, narrowly elliptic to very slightly oblanceolate (widest point 0.5–0.6 lamina length from base), dark green, glossy above, paler and somewhat duller below; petiole 1.5–5.5 mm long, 0.6–1.2 mm wide, winged, usually stellate-hairy especially on adaxial surface; lamina 24–65 mm long (mostly longer than 40 mm), 4.5–10 mm wide (length:breadth 5.5–7.5:1), mostly glabrous, often stellate-hairy along midrib near base, the occasional hair near midrib or margin, midrib impressed above but prominently raised below, other venation often visible but not prominent, both surfaces moderately glandular-punctate (density 200–300 glands/cm<sup>2</sup>), the glands c. 0.5 mm diameter, pale yellow to pale green, raised (although flush with leaf surface or slightly impressed in a few dried specimens); apex obtuse to emarginate (and slightly asymmetric); base decurrent; margin entire to serrulate (especially in distal ½), ± flat (fresh) to slightly recurved (dried). Inflorescence cymose, erect, 9–32-flowered; pedicels 3.5–8.0 mm long, angled, stellate-hairy, glandular-punctate, the glands green to brown. Bracteoles small, linear, c. 0.5 mm long, stellate-tomentose, inserted ¼–⅓ along pedicel from base. Sepals fused in proximal half, thick, approximately 1 mm long, stellate-pubescent, green when fresh, greenish brown when dried, glandular-punctate; lobes deltoid, 0.9–1.4 mm wide at base; apex acute. Petals free, lemon yellow to greenish yellow, elliptic-lanceolate, keeled (especially in distal ½) and sometimes somewhat recurved, 5.0–8.1 mm long, 1.5–2.0 mm wide (length:breadth ratio 4–5:1), tip slightly inflexed, glabrous, glandular-punctate, the glands yellow, sometimes greenish when dried. Stamens yellow, arising from calyx base, up to about twice as long as petals (shorter when immature); filaments terete, glabrous, varying in length up to 3× within individual flowers, 3.0–14.0 mm long, 0.3–0.7 mm wide; anthers 1.0–2.0 mm long, each locule c. 0.5 mm wide. Pollen ellipsoid, c. 300 µm long, tricolpate, exine reticulate. Ovary ± cylindrical, slightly swollen at base; carpels 5, fused at base, green, glabrous, glandular-punctate, 1.4–1.6 mm high, 0.5–0.9 mm wide (length:breadth c. 3:1), apex sterile and rounded; style arising from the centre of the carpels, pale yellow, glabrous, slightly longer than stamens, 6.0–14.5 mm long, 0.2–0.4 mm thick; stigma small. Fruit a schizocarp capsule, cocci 5, erect, mid-green to lemon yellow maturing to dark brown, 5.5–7.0 mm high, transversely corrugated, apex rounded and prominently rostrate (beaked) on outer angle, rostrum 1.5–3.0 mm long. Seeds dark brown to black, sub-reniform, 3.0–4.3 mm long, 1.6–2.0 mm wide, the surface smooth; raphe white, flattened, 1.8–2.0 mm long, up to ½ seed length, positioned opposite micropyle. (Figs 1a–g, 2).

Juvenile plants differ from adults in having larger leaves (petiole 5–8 mm long, lamina 53–83 mm long) that tend to be slightly more oblanceolate (widest point 0.6–0.7 lamina length from base) with consistently serrulate to serrate margins. (Fig. 1b).

**Selected specimens examined:** New South Wales: Central Tablelands: Wollemi National Park: Lee Creek and upper Growee River catchments [specific locality details withheld for conservation purposes]: *S. Clarke s.n.*, 19 Jun 2003 (NSW 613315); *S. Clarke s.n.*, 29 Jun 2003 (NSW 613314); *H. Washington s.n.*, 21 Aug 2003, (NSW 613338); *D. Crayn* 595, *J. Allen, H. Washington, P. Weston*, 28 Aug 2003 (NSW, CANB, K, MEL, PERTH); *S. Clarke s.n.*, 27 Nov 2003, (NSW 613307, 613312, 613313); *D. Crayn* 771, 773–778, *J. Allen, S. Clarke, B. Horton, C. Pavich, H. Washington*, 4 Dec 2003 (NSW).

**Derivation of epithet:** from the Latin *scopulinus* (Greek: *skopelos*, a projecting point of rock, rock, cliff, crag, shelf or ledge) meaning 'pertaining to cliffs' referring to the species' preference for rocky ledges and clefts associated with sandstone 'pagoda' formations.

**Flowering period:** Flowers have been recorded in April–September with fruits reaching full maturity in December.

**Habitat:** Found on shallow sandy soils derived from Triassic Narrabeen sandstone (Bembrick 1980) on small ledges or in sloping clefts, at 780–900 m altitude, along narrow 'pagoda' ridge tops. It grows in heath under a sparse over-storey of *Eucalyptus oreades* and *E. sparsifolia*. This community has similarities with Narrabeen Talooby Pagoda Rocky Heath-Scrub as defined by Bell (1997) but does not fit readily into that community, and may be distinct. Species commonly associated with *Leionema scopulinum* include *Acacia obtusifolia*, *A. terminalis*, *A. ulicifolia*, *Allocasuarina distyla*, *Amperea xiphoclada*, *Boronia anemonifolia*, *B. angustisepala*, *Callitris endlicheri*, *Calytrix tetragona*, *Caustis pentandra*, *Cooperuookia barbata*, *Dampiera adpressa*, *Dillwynia retorta*, *Eucalyptus rossii*, *Epacris reclinata*, *Exocarpus cupressiformis*, *Goodenia decurrens*, *Hibbertia monogyna*, *Isopogon anemonifolius*, *Leptospermum arachnoides*, *L. parvifolium*, *L. sphaerocarpon*, *Leucopogon muticus*, *L. setiger*, *Logania albiflora*, *Monotoca scoparia*, *Ochrosperma oligomerum*, *Persoonia linearis*, *Phebalium squamulosum* subsp. *gracile*, *Philotheca salsolifolia* subsp. *salsolifolia*, *Platysace linifolia*, *Pseudanthus pimelioides*. It also grows with four rare plants listed under ROTAP (Briggs & Leigh 1996); *Prostanthera lindii* (coded 2KC-), *Epacris coriacea* (3RC-), *Banksia penicillata* (3RC-), *Homonanthus cernuus* (2RCa) and grows near the endangered *Pultenaea* sp. 'Olinda' (Schedule 1, NSW Threatened Species Conservation Act 1995) and *Pultenaea* sp. aff. *glabra* (*P. glabra* is vulnerable listed under ROTAP; 3VCa).

**Distribution:** Very restricted range, being found to date only in 29 sites in the north-west of Wollemi National Park around the headwaters of Lee Creek and the Growee River, Central Western Slopes, New South Wales (Fig. 3). Targetted searches of similar habitat nearby by SWC and HW have failed to find further occurrences of this species.

**Proposed conservation status:** This species comprises fewer than 1500 plants and is restricted geographically to an area 14 km (N-S) by 7 km (E-W). All known populations occur within Wollemi National Park. The species occurs only in relatively inaccessible sites such as ledges and clefts on rocky ridgetops which might indicate sensitivity to fire, but which also appears to protect it from feral browsers such as goats. Strict application of ROTAP (Briggs & Leigh 1996) criteria would lead to rare listing (2RCit). However, other species in the area having similar or greater distributions and population sizes are listed under the NSW Threatened Species Conservation Act 1995 as endangered (Schedule 1, e.g. *Pultenaea* sp. 'Olinda') or vulnerable (Schedule 2, e.g. *Eucalyptus cammonii*, *Grevillea evansiana*, *Persoonia marginata*). Since *Leionema scopulinum* does not appear to be any more secure than those species, Schedule 2 (vulnerable) or even Schedule 1 (endangered) listing is considered appropriate.

**Notes:** *Leionema scopulinum* most closely resembles *L. ralstonii*, *L. sympetalum* and *L. viridiflorum* but can be distinguished from all those species by the following attributes: the erect inflorescence (the inflorescence is nutant in the other three species), the larger size of the leaves and the larger size of the coccus beak (Wilson 1970, Weston & Harden 2001). *Leionema scopulinum* is restricted to ridge tops in the Lee Creek and upper Growee River catchments (Wollemi National Park) where it grows on ledges and in clefts associated with sandstone 'pagoda' formations. *Leionema sympetalum*, which grows on rocky outcrops in dry sclerophyll forest east of Rylstone (Weston & Harden 2001), is the only species which occurs near *L. scopulinum*.



**Fig. 1.** *Leonema scopulinum* a, flowering branchlet (S. Clarke s.n., NSW 613314); b, juvenile leaf (S. Clarke s.n., NSW 613313); c, mature adult leaf (D. Crayn 595 et al.); d, stellate hair (D. Crayn 595 et al.); e, flower (D. Crayn 595 et al.); f, seed (D. Crayn 778 et al.); g, fruit including seeds (D. Crayn 778 et al.). Scale bar a = 3.75 cm, b, c = 4 cm, d = 275  $\mu$ m, e = 1.2 cm, f = 0.5 cm, g = 1 cm.

However, in addition to the attributes mentioned above, the tubular flowers and glabrous branchlets of *L. sympetalum* prevent the two species being confused. *Leionema ralstonii* grows in open forest and on ridges in the Bega to Eden district and *L. viridiflorum* grows in heath and on trachyte outcrops in the Warrumbungle and Mt Kaputar National Parks (Weston & Harden 2001).

### Modified *Flora of NSW* key to some species of *Leionema*

The following replaces the second lead of the first couplet in the *Flora of NSW Leionema* key (Weston & Harden 2001).

1\* Petals usually > 7 mm long, erect; stamens considerably exceeding petals.

12 Petals fused ..... 13 *L. sympetalum*

12\* Petals free

13 Stems glabrous, strongly angled ..... 12 *L. ralstonii*

13\* Stems hairy,  $\pm$  terete or angled.

14 Leaves  $\pm$  spreading, ovate to lanceolate, c. 10 mm long, obtuse; stems pilose ..... 11 *L. carruthersii*

14\* Leaves  $\pm$  erect, narrow-oblong to elliptic, 20–65 mm long, obtuse to retuse; stems stellate pubescent to tomentose.

15 Stems  $\pm$  terete; leaves 20–40 mm long, margins entire; inflorescence nutant; coccus beak 1.5 mm long ..... 14 *L. viridiflorum*

15\* Stems angled; leaves 24–65 mm long, margins frequently serrulate; inflorescence erect; coccus beak 1.5–3 mm long ..... 15 *L. scopulinum*

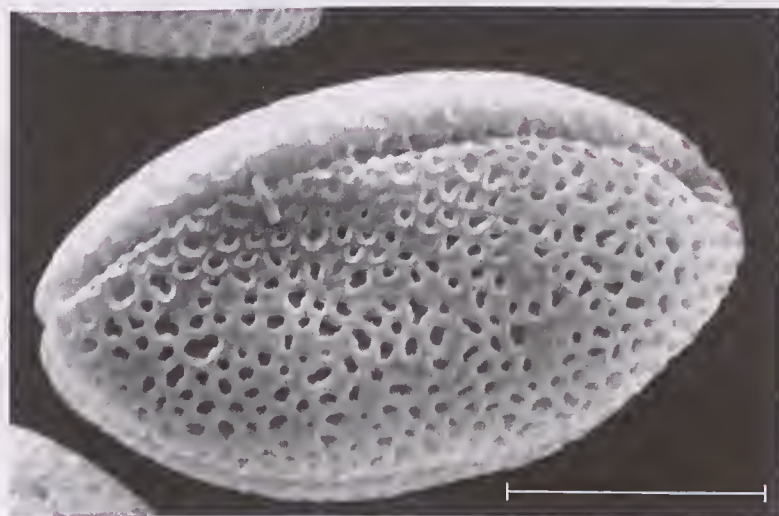


Fig. 2. SEM micrograph of a pollen grain (voucher *D. Crayn 595 et al.*). Scale bar = 10  $\mu$ m.

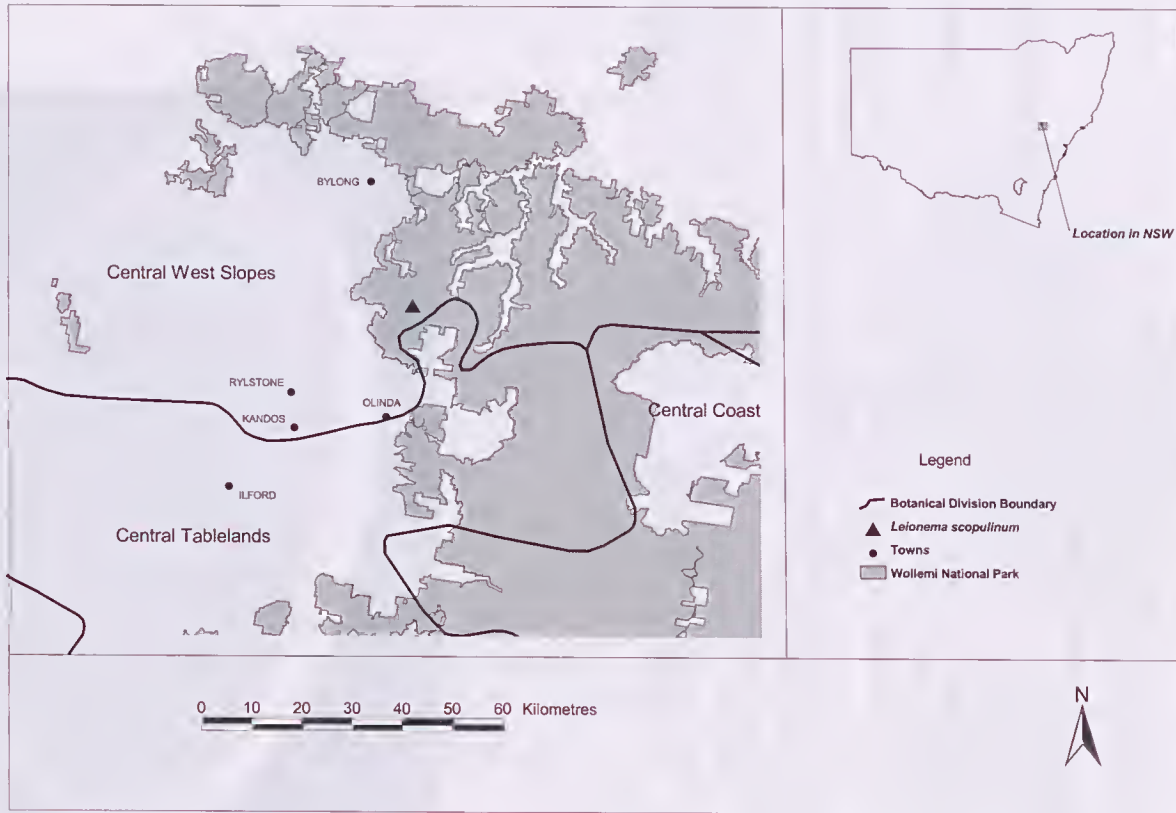


Fig. 3. Approximate location of the known populations of *Leionema scopulinum*.

Table 1. Comparison of selected characteristics of *Leionema scopulinum* and the three species most similar to it, based on the literature (Wilson 1970, Weston & Harden 2002) and observations on specimens held at NSW.

	<i>L. scopulinum</i>	<i>L. ralstonii</i>	<i>L. sympetalum</i>	<i>L. viridiflorum</i>
<b>Branchlets</b>	angled	angled	terete	terete
<b>Branchlet Indumentum</b>	stellate-hairy	glabrous	glabrous	stellate-hairy
<b>Leaf Lamina Shape</b>	elliptic to slightly oblanceolate	oblanceolate to narrowly obovate	obcuneate to elliptic	narrowly oblong to elliptic
<b>Lamina Length</b>	24–65 mm	25–50 mm	15–35 mm	20–40 mm
<b>Lamina Width</b>	4.5–10 mm	5–8 mm	4–8 mm	4–8 mm
<b>Leaf Margin</b>	mostly serrulate	entire	serrulate toward apex	entire
<b>Inflorescence</b>	erect	nutant	nutant	nutant
<b>Flowers per Inflorescence</b>	9 to 32	4 to 7	1 to 3	6 to 12
<b>Petal Fusion</b>	petals free	petals free	petals fused	petals free
<b>Petal Length</b>	up to 8 mm	up to 8 mm	up to 15 mm (including tube)	up to 10 mm
<b>Petal Indumentum</b>	glabrous	glabrous	glabrescent	stellate-hairy
<b>Coccus Height</b>	5.5–7 mm	4–5 mm	c. 4 mm	c. 6 mm
<b>Coccus Beak Length</b>	1.5–3 mm	up to 1 mm	up to 1.5 mm	up to 1.5 mm
<b>Geographical Distribution (NSW)</b>	Wollemi National Park, Central Western Slopes	Bega to Eden, South Coast	Ranges east of Rylstone, Central Tablelands	Warrumbungle and Mt. Kaputar National Parks (mainly), Northern Tablelands and North Western Slopes

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## References

- Bell, S. (1997) *Vegetation communities, Wollemi National Park*. Unpublished report for National Parks and Wildlife Service, Hunter Region.
- Bembrick, C. (1980) *Geology of the Blue Mountains, western Sydney Basin*. Pp. 135–161 in C. Herbert and R. Helby (eds) *A Guide to the Sydney Basin* (Government Printer: Sydney).
- Bentham, G. (1863) *Flora Australiensis, Vol. 1*. (Reeve & Co.: London).
- Briggs, J.D. and Leigh, J.H. (1996) *Rare or Threatened Australian Plants, 1995 Revised Edition*. (CSIRO: Collingwood).
- Mueller, F. von (1882) *Systematic Census of Australian Plants. Part 1 — Vasculares* (McCarron Bird: Melbourne).
- Mueller, F. von (1889) *Second Systematic Census of Australian Plants. Part 1 — Vasculares* (McCarron Bird: Melbourne).
- Weston, P.H. and Harden, G.J. (2001) *Leionema*. Pp. 306–310 in Harden, G.J. (ed.), *Flora of New South Wales, Vol. 2 Revised Edition*. (New South Wales University Press: Kensington).
- Wilson, P.G. (1970) A taxonomic revision of the genera *Crowea*, *Eriosteum* and *Phebalium* (Rutaceae). *Nuytsia* 1: 3–155.
- Wilson, P.G. (1998) New species and nomenclatural changes in *Phebalium* and related genera (Rutaceae). *Nuytsia* 12: 267–288.

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